Growing

LETTUCE

in hawaii

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About the Author

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GROWING LETTUCE IN HAWAII

Foreword

Lettuce is the most popular salad crop grown in Hawaii today. There are two types of lettuce grown commercially for the market in Hawaii. The regular crisp-head type is of the Great Lakes variety and is grown mostly in the higher elevations at Kamuela, Hawaii, and Kula, Maui. The semi-head type is of the Manoa or Green Mignonette variety and is grown in the lower elevations, mostly on Oahu.

Approximately 3 million pounds of lettuce are produced annually in Hawaii. One and three-quarters million pounds are imported from California. Of the 3 million pounds produced locally, about a million are of the semi-head Manoa variety.

Varieties

The Hawaiian market demands both the crisp-head and semi-head types of lettuce. The crisp-head type is preferred for salads while the semi-head type is preferred for sandwich filling and salad decorations. The Great Lakes strains, Premier, No. 54 and 200-A, are the principal crisp-head varities grown at the higher elevations while the Manoa Special and Manoa Supreme varieties are the semi-head lettuce grown in the lowlands.

In recent years, two new varieties named Anuenue and Kaala have been introduced by the Hawaii Agricultural Experiment Station. These new varieties are of the crisp-head type. They were especially bred and selected for lowland growing conditions because the Great Lakes and other heading varieties are not adapted to the warm lowland growing conditions. Anuenue makes its best growth between fall and spring months, while the Kaala variety is suitable for year-round growing conditions in the lowlands. Kaala and Anuenue are also much more resistant to tip burn than the Manoa during the hot summer months in the lowlands.

Climatic Requirements

The crisp-head type of lettuce, such as Great Lakes, requires a relatively low average temperature, particularly during the latter part of the growing period, to form solid heads. Temperatures averaging 60°–70°F. are ideal for head lettuce growing and this temperature condition is found in the higher elevations of Kamuela, Hawaii, and Kula, Maui. High temperatures above 75°F. will produce loose, soft-headed lettuce. High temperatures will also cause the lettuce plant to bolt before the heads mature. This bolting or elongation of the stalk will cause a separation of the leaves at the base and result in a loose, puffy head, or no head formation at all. The development of the seed stalk in warm weather will increase the bitterness in many varieties.

Unfavorably high temperatures the last few days before maturity will usually cause tip burning of the young lettuce leaves.

Moisture Requirements

The lettuce requires a fairly abundant and constant water supply. Any unfavorable soil moisture supply will prevent its normal growth. Low soil moisture, even for a few days, may be ruinous to a lettuce crop in the late stages of development. Excessive soil moisture caused by prolonged rains with standing water for even a few days may do great damage to the crop. Heavy rains after heads begin to form may cause great loss by upsetting the growth rate of the plant, especially on soils high in available nitrogen. The sudden increase in soil moisture, with the resulting rapid growth may, at any time after head formation, interfere with the normal folding in of the leaves, thereby preventing the formation of a solid head.

A field of Great Lakes lettuce at Kamuela, Hawaii.

Soil Requirement

The lettuce will do best in fertile soils that are well drained but with a good water-holding capacity, free from nematodes and with a pH of 6.0–7.0. Soils with pH below 6.0 are too acid for the best growth of lettuce. Acid soils should be limed to raise the pH to something between 6.0–7.0. Lettuce has a fairly high salt tolerance and, therefore, can be grown with brackish water containing salt up to 60 grains per gallon.

Soil Preparation

Soil for lettuce should be plowed deep wherever practicable. Manure and other organic matter should be plowed in to a depth of 6–8 inches. The soil should be disked or harrowed to a fine texture to insure the good germination of the small lettuce seeds. Soil clods should be broken and all stones and trash should be removed from the field.

The crop is usually planted on 2- to 4-foot wide beds, raised to a height of about 6–8 inches, on soils that are heavy and slow in draining off. On well-drained, light soils, raised beds may be detrimental because the crop will suffer more from lack of soil moisture during periods of limited water supply than it would under flat culture.

If the soil must be fumigated for nematode control with DD or EDB, it should be done after the soil is prepared, and an interval of 2–3 weeks should be allowed after treatment before the field is planted.

Planting

Lettuce is usually seeded directly in the field and thinned out, although on a small scale it can be seeded in seedling beds and transplanted to the field.

In direct field seeding, the seeds are planted in rows spaced 12–18 inches apart with several seeds spaced 8–10 inches apart in the rows or in a continuous row. The seeds are usually treated with a seed disinfectant such as Arasan or copper oxide before planting to prevent damping-off. The seeds should be planted ¼–½-inch deep, but *not* more than ½-inch deep, especially on heavy soils. Two pounds of seeds will plant an acre.

In the transplanted crop, the seedlings are set in the field in rows spaced

10–15 inches apart, with the plants spaced 8–10 inches apart in the rows. About ¼–½-pound of seed will produce enough seedlings to plant an acre.

The seedling bed soil should be treated for nematodes, and about 4 pounds of 8-20-5 or 8-12.5-6 fertilizer should subsequently be applied for each 100 square feet of bed area. This should be thoroughly mixed with the soil before planting.

Thinning

The field seeded lettuce crop must be thinned out with a hoe to remove from the rows all plants except small clusters at regular intervals of 10–12 inches. This is called blocking and it is usually done 10–14 days after planting. A few days later all but one of the plants should be removed from each of the clusters left in the blocking operation.

The blocking and thinning operations should not be delayed until the plants suffer from crowding.

Note: It is often necessary to replace the soil around the plants, after completion of the thinning operation, to avoid injury to the seedlings left growing.

Irrigation

Lettuce requires a constant and fairly high soil moisture content, from planting to harvest. Wide fluctuations in soil moisture, however, especially during the later stages of development, may cause great damage to the crop. *Remember:* The soil surface should be wet for only a short time after rain or irrigation, but the moisture content should never be allowed to go so low that the sub-soil becomes dry.

Irrigation should be done in the early morning, while the plants are cool and before they reach the wilting point. Great loss from tip burn and slime rot may result from careless irrigation of nearly mature lettuce by a sprinkler system during the warmest hours of the day.

There are two periods in the development of lettuce when even slightly excessive amounts of water are likely to injure the crop. Too much water in the early stages may cause the development of a shallow and limited root system, while too much water during heading may cause too rapid a rate of growth, with soft or puffy heads resulting.

Cultivation

Cultivation of lettuce is done primarily to destroy weeds. It is also important, however, in preventing the formation of a crust over certain types of soils, which prevents the penetration of water. Thorough cultivation of the soil surface should follow every heavy rain to prevent the formation of a surface crust. All cultivation of lettuce should be shallow, however, as the plants are shallow rooted.

Careful root pruning by cultivation may be used to advantage during the heading period, after heavy rains have fallen. This practice is useful in checking too rapid a growth rate and the production of soft, puffy heads.

Cultivation for weed control is most effective when done on a sunny day, and while the weeds are small and the soil surface dry. Two to three weeding operations may be necessary for a crop of lettuce.

Fertilizer Applications

A fertilizer such as 8-12.5-6, 8-20-5, or 10-10-5, applied at the rate of 1,000 to 1,500 pounds per acre, should be sufficient for a crop of lettuce on most soils. The fertilizer should be applied in two applications—one-half at planting and the other half either at thinning or 3–4 weeks after transplanting. The application of nitrogen as a side dressing late in the development of the plant may cause too vigorous a growth rate, resulting in large, loose heads or an undesirable ribbiness.

On acid soils of the low humic latosols group (N1-N6), the application of lime at a rate not exceeding 2 tons per acre tend to reduce the exchangeable manganese content in the soil and increase plant yield.

Insect Control

The most common insect pests of lettuce are the cutworms, aphids, thrips, red spider mites, beet webworm, and garden looper. Slugs and snails may also become troublesome in wet areas.

Cutworms attack the young seedlings and cause considerable damage. Their presence can be detected by the presence of damaged seedlings which appear as though they were cut off at the ground. These worms are seldom seen because they feed at night and hide in the soil during the day. They may be controlled with DDT, Toxaphene or Malathion sprayed or dusted around the base of the plants, and on the soil around them.

The beet webworm and garden looper are caterpillars which feed on the foliage of the plant. A methoxychlor spray or dust will effectively control these insects.

The aphids, thrips, and red spider mites are tiny sucking pests. They feed on the foliage of the plants by sucking out the plant juices. These pests may be controlled by spraying or dusting with Malathion and sulfur.

Slugs and snails are best controlled by applying baits around the plants in the infested area and by spraying the ground around the area with a metaldehyde spray (4 pounds of 50% W.P. in 3 gallons of water).

Disease Control

The most common diseases of lettuce are damping-off, tip burn, drop, and bottom rot.

The damping-off disease either causes the decay of the seed or seedlings in the soil, or the collapse of small seedlings as a result of injury of the stem near the soil surface. This disease is caused by several soil organisms. To control this disease, the seeds should be treated with a seed disinfectant such as Arasan or Cuprocide before planting. If damping-off becomes serious in the seedling bed, the soil should be treated either with a Formaldehyde drench, using a solution containing one part Formaldehyde in 30 parts of water and applied at the rate of 1 quart to 1 square foot, or with methyl bromide at the rate of 1 pound per 100 square feet.

Tip burn is a common non-parasitic disease which becomes serious during periods of high temperatures. It is characterized by the breaking down of the tissues of the younger leaves at their margins. Plants in a succulent condition resulting from rapid growth are more susceptible to tip burn than those less succulent. Excessive moisture or nitrogen fertilizer applications during heading of the crop should be avoided during warm weather.

Drop, or *Sclerotinia* disease is caused by a soil fungus. This disease usually develops most rapidly under cool, moist conditions. The diseased plants will wilt down into a slimy mass showing white, cotton-like growth on the infected areas. The best control measures for this disease are the removal of all infected plants from the field, rotation of crops, and the improvement of the soil drainage by the use of raised beds to allow the rapid drying of the soil surface after rains or irrigation. Calcium cyanamide applied at the rate of 800–1,000 pounds per acre and worked into the soil to a depth of 2–4 inches, two to three weeks before planting, will give good control of this disease. The cyanamide will also add calcium to the soil, neutralize the soil acidity, kill the weed seeds, and supply nitrogen to the soil.

Bottom rot or Rhizoctonia disease is caused by one of the soil organisms that also commonly causes damping-off. This disease is first noticed as rust-colored, sunken spots on the petioles and mid-ribs, and a slimy rot on the blades of the bottom leaves of the plant that touch the soil. As the disease advances, it spreads from the lower leaves upward until the entire head becomes a slimy mass.

Bottom rot becomes most severe during wet and warm weather. The best control measure is a rotation with crops such as corn or onions. Spraying or dusting the base of the plants with a fungicide may control the disease to some extent.

Terraclor 75 W (Pentachloronitrobenzene) applied at the rate of 10–20 pounds per acre in 25–50 gallons of water as a spray is reported to be effective in the control of drop and Rhizoctonia diseases. One spraying is applied in a 6–12 inch wide band after thinning of the crop.

When applying insecticides and fungicides, read the labels carefully and follow directions accurately. If a chemical is not registered for use on lettuce, do not use it. Apply the chemicals only in the amounts specified and at the times designated.

If, for instance, the specifications call for 2 pounds in 100 gallons of water per acre, use this amount and no more. If the instructions call for a period of 14 days between last spray and harvest, do not harvest earlier than the required number of days. This will enable you to stay within the residue tolerance limit set up by the Federal Pure Food and Drug Act.

Harvesting

Head lettuce should not be harvested until mature unless market and weather conditions justify premature cutting. During a period of very warm weather a few days' delay in cutting the crop may mean much loss from bolting and from tip burn.

In harvesting the heads should be cut at the soil surface, leaving as many of the wrapper leaves uninjured as possible. The soiled and spoiled leaves on the base of the head should be removed before packing.

If the heads must be washed to remove soil particles, they should be placed with the butt ends up to allow excess water to run out before packing.

Lettuce is a perishable crop and requires extreme care in handling. Cutting, trimming, and packing should be done with care to avoid destroying the wrapper leaves and bruising the heads. All heads showing traces of disease infection should be discarded. The cut heads should be protected from the sun and wind. They should be put under refrigeration at a temperature of 35°–50°F.

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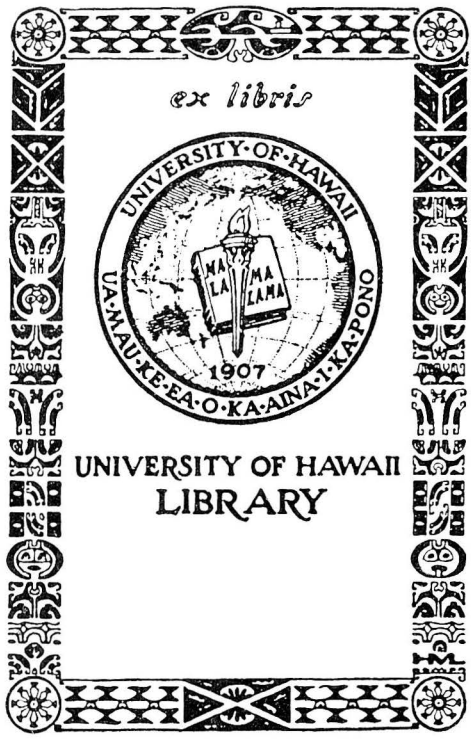
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